

Reply to Final Office Action of March 08, 2005
Amendment Dated: May 26, 2005

Appl. No.: 09/824,837
Attorney Docket No.: CSCO-004/3579

Listing of Claims

1 Claim 1 (Currently Amended): A method of providing different quality of services
2 (QOS) to different layer-3 datagrams to be transported from a first network device to a
3 second network device connected by a backbone, each of said first network device and
4 said second network device operating as a layer-3 device, said method comprising:

5 provisioning a tunnel in said first network device, said tunnel terminating at said
6 second network device via said backbone, said tunnel being implemented to provide
7 different QOS to different packets depending on a packet header for the corresponding
8 packet;

9 indicating in said first network device whether to provide different QOS to different
10 datagrams received on a point-to-point session;

11 receiving a layer-3 datagram on said point-to-point session in said first network
12 device, said layer-3 datagram containing a datagram header and a datagram data;

13 examining said datagram header in said first network device to determine a QOS
14 to be provided to said layer-3 datagram, wherein said examining determines to provide
15 different QOS to datagrams received on said point-to-point session based on said
16 indicating;

17 forming at least one packet in said first network device by encapsulating at least
18 said datagram data with a layer-3 header, wherein said layer-3 header identifies said
19 tunnel to said second network device, said at least one packet containing a packet header
20 to provide said QOS determined by said examining; and

21 sending said at least one packet to said second network device on said tunnel,
22 whereby layer-3 datagrams received on said point-to-point session receive different
23 QOS based on the corresponding datagram headers if said indicating indicates that
24 different QOS are to be provided to different datagrams received on said point-to-point
25 session.

1 Claim 2 (Original): The method of claim 1, wherein said backbone is implemented
2 to transport packets according to asynchronous transfer mode (ATM) protocol.

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1 Claim 3 (Original): The method of claim 2, wherein said provisioning further
2 comprises implementing said tunnel using a plurality of virtual circuits (VC) forming a VC
3 bundle, wherein each of said plurality of virtual circuits provides one of said different QOS
4 provided by said tunnel.

1 Claim 4 (Original): The method of claim 2, wherein said at least one packet
2 comprises a plurality of packets, wherein each of said plurality of packets is formed
3 according to said ATM protocol.

1 Claim 5 (Original): The method of claim 1, wherein said tunnel is implemented
2 using UDP/IP packets, wherein each UDP/IP packet contains a TOS/Precedence field, said
3 TOS/Precedence field determining the QOS provided to the corresponding UDP/IP packet,
4 said at least one packet comprising a UDP/IP packet, said forming comprising determining
5 the value of said TOS/Precedence field according to said datagram header of said layer-3
6 datagram.

1 Claim 6 (Previously Amended): The method of claim 5, wherein said layer-3
2 datagram comprises an IP datagram, and wherein said forming comprises copying the
3 TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP packet
4 encapsulating said IP datagram, wherein the header of said UDP/IP packet comprises said
5 layer-3 header.

1 Claim 7 (Canceled): The method of claim 1, wherein said receiving comprises
2 receiving said layer-3 datagram on a point-to-point session, said method further comprising
3 indicating in said first network device whether to provide different QOS to different
4 datagrams received on said point-to-point session, wherein said first network device
5 provides different QOS to datagrams received on said point-to-point session based on said
6 indicating.

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1 Claim 8 (Original): The method of claim 7, further comprising indicating in a table
2 a default QOS to be used with said point-to-point session, wherein said determining
3 comprises associating said default QOS to said layer-3 datagram if said datagram header
4 does not provide an indication of the QOS to be provided to said layer-3 datagram.

1 Claim 9 (Original): The method of claim 1, wherein said first network device
2 comprises either a network access server (NAS) or a home gateway.

1 Claim 10 (Currently Amended): A first network device providing different quality
2 of services (QOS) to different layer-3 datagrams to be transported to a second network
3 device connected by a backbone, each of said first network device and said second
4 network device operating as a layer-3 device, said first network device comprising:

5 means for provisioning a tunnel terminating at said second network device via said
6 backbone, said tunnel being implemented to provide different QOS to different packets
7 depending on a packet header for the corresponding packet;

8 means for indicating in said first network device whether to provide different QOS
9 to different datagrams received on a point-to-point session;

10 means for receiving a layer-3 datagram on said point-to-point session, said layer-3
11 datagram containing a datagram header and a datagram data;

12 means for examining said datagram header to determine a QOS to be provided to
13 said layer-3 datagram, wherein said means for examining determines to provide different
14 QOS to datagrams received on said point-to-point session based on said indicating;

15 means for forming at least one packet by encapsulating at least said datagram data
16 with a layer-3 header, wherein said layer-3 header identifies said tunnel to said second
17 network device, said at least one packet containing a packet header to provide said QOS
18 determined by said examining; and

19 means for sending said at least one packet to said second network device on said
20 tunnel,

21 whereby layer-3 datagrams received on said point-to-point session receive different
22 QOS based on the corresponding datagram headers if said means for indicating indicates

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23 that different QOS are to be provided to different datagrams received on said point-to-
24 point session.

1 Claim 11 (Original): The first network device of claim 10, wherein said backbone
2 is implemented to transport packets according to asynchronous transfer mode (ATM)
3 protocol, wherein said means for provisioning implements said tunnel using a plurality of
4 virtual circuits (VC) forming a VC bundle, wherein each of said plurality of virtual circuits
5 provides one of said different QOS provided by said tunnel, wherein said at least one
6 packet comprises a plurality of packets, wherein each of said plurality of packets is formed
7 according to said ATM protocol.

1 Claim 12 (Original): The first network device of claim 10, wherein said tunnel is
2 implemented using UDP/IP packets, wherein each UDP/IP packet contains a
3 TOS/Precedence field, said TOS/Precedence field determining the QOS provided to the
4 corresponding UDP/IP packet, said at least one packet comprising a UDP/IP packet, said
5 means for forming determining the value of said TOS/Precedence field according to said
6 datagram header of said layer-3 datagram.

1 Claim 13 (Previously Amended): The first network device of claim 12, wherein said
2 layer-3 datagram comprises an IP datagram, and wherein said means for forming copies
3 the TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP
4 packet encapsulating said IP datagram, wherein the header of said UDP/IP packet
5 comprises said layer-3 header.

1 Claim 14 (Canceled): The first network device of claim 10, wherein said means for
2 receiving receives said layer-3 datagram on a point-to-point session, said first network
3 device further comprising means for indicating to indicate whether to provide different
4 QOS to different datagrams received on said point-to-point session, wherein said first
5 network device provides different QOS to datagrams received on said point-to-point
6 session based on said indicating.

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1 Claim 15 (Original): The first network device of claim 14, further comprising
2 indicating in a table a default QOS to be used with said point-to-point session, wherein
3 said means for determining associates said default QOS to said layer-3 datagram if said
4 datagram header does not provide an indication of the QOS to be provided to said layer-3
5 datagram.

1 Claim 16 (Original): The first network device of claim 10, wherein said first
2 network device comprises either a network access server (NAS) or a home gateway.

1 Claim 17 (Currently Amended): A first network device providing different quality
2 of services (QOS) to different layer-3 datagrams to be transported to a second network
3 device connected by a backbone, each of said first network device and said second
4 network device operating as a layer-3 device, said first network device comprising:

5 a memory indicating whether to provide different QOS to different layer-3
6 datagrams related to a point-to-point session;

7 an input interface receiving a layer-3 datagram, said layer-3 datagram containing
8 a datagram header and a datagram data;

9 a classifier determining whether said layer-3 datagram relates to said point-to-point
10 session;

11 a marker determining a QOS to be provided to said layer-3 datagram, wherein said
12 marker provides different QOS to different layer-3 datagrams only if said memory
13 indicates that different QOS is to be provided to different layer-3 datagrams related to said
14 point-to-point session;

15 a tunnel encapsulator encapsulating at least said datagram data with a layer-3 header
16 to generate an encapsulated data, said layer-3 header identifies a tunnel set up via a
17 backbone to said second network device, said tunnel providing different QOS to packets
18 having different packet headers;

19 a forwarding block forming at least one packet to transport said encapsulated data,
20 wherein said encapsulated data is encapsulated for transporting on said tunnel, said at least

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21 one packet containing a packet header to provide said QOS determined by said examining;
22 and
23 an output interface sending said at least one packet to said second network device
24 on said tunnel,
25 ~~whereby layer-3 datagrams receive different QOS based on the corresponding~~
26 ~~datagram headers~~
27 whereby said first network device provides different QOS to different layer-3
28 datagrams received only on some point-to-point sessions.

1 Claim 18 (Original): The first network device of claim 17, wherein said marker
2 examines said datagram header to determine said QOS.

1 Claim 19 (Original): The first network device of claim 18, wherein said layer-3
2 datagram is received on a point-to-point session.

1 Claim 20 (Canceled): The first network device of claim 19, further comprising:
2 a memory indicating whether to provide different QOS to different layer-3
3 datagrams related to said point-to-point session; and
4 a classifier determining whether said layer-3 datagram relates to said point-to-point
5 session, wherein said marker provides different QOS to different layer-3 datagrams only
6 if said memory indicates that different QOS to different layer-3 datagrams relates to said
7 point-to-point session,
8 whereby said first network device provides different QOS to different layer-3
9 datagrams received only on some point-to-point sessions.

1 Claim 21 (Original): The first network device of claim 20, wherein said packet
2 comprises an ATM cell and said tunnel is implemented using a virtual circuit (VC) bundle
3 containing a plurality of virtual circuits, wherein each of said plurality of virtual circuits
4 is provisioned to provide one of said different QOS provided by said tunnel.

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1 Claim 22 (Previously Amended): The first network device of claim 20, wherein said
2 packet comprises a UDP/IP packet containing a type of service (TOS)/precedence field,
3 wherein said layer-3 datagram comprises an Internet protocol (IP) datagram also
4 containing a TOS/precedence field, said marker providing at least some of the bits of said
5 TOS/precedence field of said IP datagram for copying into said TOS/precedence field of
6 said UDP/IP packet, wherein the header of said UDP/IP packet comprises said layer-3
7 header.

1 Claim 23 (Original): The first network device of claim 20, wherein said memory
2 further indicates a default QOS to be provided to datagrams received on said point-to-point
3 connection, wherein said marker accesses said memory to provide said default QOS to said
4 layer-3 datagram if QOS cannot be determined by examining said packet header.

1 Claim 24 (Currently Amended): A computer readable medium carrying one or more
2 sequences of instructions for causing a first network device to provide different quality of
3 services (QOS) to different layer-3 datagrams when sending to a second network device
4 on a backbone, said first network device, each of said first network device and said second
5 network device operating as a layer-3 device, said backbone being contained in a
6 communication network, wherein execution of said one or more sequences of instructions
7 by one or more processors contained in said network device causes said one or more
8 processors to perform the actions of:

9 provisioning a tunnel in said first network device, said tunnel terminating at said
10 second network device via said backbone, said tunnel being implemented to provide
11 different QOS to different packets depending on a packet header for the corresponding
12 packet;

13 indicating in said first network device whether to provide different QOS to different
14 datagrams received on a point-to-point session;

15 receiving a layer-3 datagram in said first network device, said layer-3 datagram
16 containing a datagram header and a datagram data;

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17 examining said datagram header in said first network device to determine a QOS
18 to be provided to said layer-3 datagram, wherein said examining determines to provide
19 different QOS to datagrams received on said point-to-point session based on said
20 indicating;

21 forming at least one packet in said first network device by encapsulating at least
22 said datagram data with a layer-3 header, wherein said layer-3 header identifies said
23 tunnel to said second network device, said at least one packet containing a packet header
24 to provide said QOS determined by said examining; and

25 sending said at least one packet to said second network device on said tunnel,
26 whereby layer-3 datagrams received on said point-to-point session receive different
27 QOS based on the corresponding datagram headers if said indicating indicates that
28 different QOS are to be provided to different datagrams received on said point-to-point
29 session.

1 Claim 25 (Original): The computer readable medium of claim 24, wherein said
2 backbone is implemented to transport packets according to asynchronous transfer mode
3 (ATM) protocol.

1 Claim 26 (Original): The computer readable medium of claim 25, wherein said
2 provisioning further comprises implementing said tunnel using a plurality of virtual circuits
3 (VC) forming a VC bundle, wherein each of said plurality of virtual circuits provides one
4 of said different QOS provided by said tunnel.

1 Claim 27 (Original): The computer readable medium of claim 25, wherein said at
2 least one packet comprises a plurality of packets, wherein each of said plurality of packets
3 is formed according to said ATM protocol.

1 Claim 28 (Previously Amended): The computer readable medium of claim 24,
2 wherein said tunnel is implemented using UDP/IP packets, wherein each UDP/IP packet
3 contains a TOS/Precedence field, said TOS/Precedence field determining the QOS

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4 provided to the corresponding UDP/IP packet, said at least one packet comprising a
5 UDP/IP packet, said forming comprising determining the value of said TOS/Precedence
6 field according to said datagram header of said layer-3 datagram, wherein the header of
7 said UDP/IP packet comprises said layer-3 header.

1 Claim 29 (Original): The computer readable medium of claim 28, wherein said
2 layer-3 datagram comprises an IP datagram, and wherein said forming comprises copying
3 the TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP
4 packet encapsulating said IP datagram.

1 Claim 30 (Canceled): The computer readable medium of claim 24, wherein said
2 receiving comprises receiving said layer-3 datagram on a point-to-point session, said
3 method further comprising indicating in said first network device whether to provide
4 different QOS to different datagrams received on said point-to-point session, wherein said
5 first network device provides different QOS to datagrams received on said point-to-point
6 session based on said indicating.

1 Claim 31 (Original): The computer readable medium of claim 30, further
2 comprising indicating in a table a default QOS to be used with said point-to-point session,
3 wherein said determining comprises associating said default QOS to said layer-3 datagram
4 if said datagram header does not provide an indication of the QOS to be provided to said
5 layer-3 datagram.

1 Claim 32 (Original): The computer readable medium of claim 24, wherein said first
2 network device comprises either a network access server (NAS) or a home gateway.

1 Claim 33 (Currently Amended) A communication system comprising:
2 an access network coupled to a plurality of remote systems, said access network
3 forwarding a layer-3 datagram based on data received from one of said plurality of remote

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4 systems, wherein said layer-3 datagram contains a datagram header and a datagram data;
5 and

6 a communication network containing a backbone connecting a first network device
7 and a second network device, each of said first network device and said second network
8 device operating as a layer-3 device, said first network device being operable to:

9 provision a tunnel terminating at said second network device via said
10 backbone, said tunnel being implemented to provide different QOS to different
11 packets depending on a packet header for the corresponding packet;

12 indicate in said first network device whether to provide different QOS to
13 different datagrams received on a point-to-point session;

14 receive said layer-3 datagram, said data header indicating that said layer-3
15 datagram is to be sent to said second network device;

16 examine said datagram header in said first network device to determine a
17 QOS to be provided to said layer-3 datagram, wherein said examine determines to
18 provide different QOS to datagrams received on said point-to-point session based
19 on said indicate;

20 form at least one packet in said first network device by encapsulating at least
21 said datagram data with a layer-3 header, wherein said layer-3 header identifies said
22 tunnel to said second network device, said at least one packet containing a packet
23 header to provide said QOS determined by said examine; and

24 send said at least one packet to said second network device on said tunnel,
25 whereby layer-3 datagrams received on said point-to-point session receive
26 different QOS based on the corresponding datagram headers if said indicating
27 indicates that different QOS are to be provided to different datagrams received on
28 said point-to-point session.

1 Claim 34 (Original): The communication network of claim 33, wherein said
2 backbone is implemented to transport packets according to asynchronous transfer mode
3 (ATM) protocol.

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1 Claim 35 (Original): The communication network of claim 34, wherein said
2 provision further comprises implementing said tunnel using a plurality of virtual circuits
3 (VC) forming a VC bundle, wherein each of said plurality of virtual circuits provides one
4 of said different QOS provided by said tunnel.

1 Claim 36 (Original): The communication network of claim 34, wherein said at least
2 one packet comprises a plurality of packets, wherein each of said plurality of packets is
3 formed according to said ATM protocol.

1 Claim 37 (Original): The communication network of claim 33, wherein said tunnel
2 is implemented using UDP/IP packets, wherein each UDP/IP packet contains a
3 TOS/Precedence field, said TOS/Precedence field determining the QOS provided to the
4 corresponding UDP/IP packet, said at least one packet comprising a UDP/IP packet, said
5 forming comprising determining the value of said TOS/Precedence field according to said
6 datagram header of said layer-3 datagram, wherein the header of said UDP/IP packet
7 comprises said layer-3 header.

1 Claim 38 (Original): The communication network of claim 37, wherein said layer-3
2 datagram comprises an IP datagram, and wherein said forming comprises copying the
3 TOS/precedence bits in said IP datagram to said TOS/precedence field of a UDP/IP packet
4 encapsulating said IP datagram.

1 Claim 39 (Canceled): The communication network of claim 33, wherein said
2 receive comprises receiving said layer-3 datagram on a point-to-point session, said first
3 network device being further operable to indicate whether to provide different QOS to
4 different datagrams received on said point-to-point session, wherein said first network
5 device provides different QOS to different datagrams received on said point-to-point
6 session based on said indicating.

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1 Claim 40 (Original): The communication network of claim 39, wherein first
2 network device is further operable to indicate in a table a default QOS to be used with said
3 point-to-point session, wherein said determine comprises associating said default QOS to
4 said layer-3 datagram if said datagram header does not provide an indication of the QOS
5 to be provided to said layer-3 datagram.

1 Claim 41 (Original): The communication network of claim 33, wherein said first
2 network device comprises either a network access server (NAS) or a home gateway.

1 Claim 42 (New): The method of claim 1, wherein said indicating in said first
2 network device indicates that different QOS are to be provided to different datagrams
3 received on a first point-to-point session and that different QOS are not to be provided to
4 different datagrams received on a second point-to-point session,

5 wherein said first network device sends a first packet and a second packet with
6 different QOS, wherein said first packet and said second packet contain data received on
7 said first point-to-point session,

8 wherein said first network device sends a third packet and a fourth packet with the
9 same QOS, wherein said third packet and said fourth packet contain data received on said
10 second point-to-point session.

1 Claim 43 (New): The first network device of claim 10, wherein said means for
2 indicating indicates that different QOS are to be provided to different datagrams received
3 on a first point-to-point session and that different QOS are not to be provided to different
4 datagrams received on a second point-to-point session,

5 wherein said means for sending sends a first packet and a second packet with
6 different QOS, wherein said first packet and said second packet contain data received in
7 datagrams on said first point-to-point session,

8 wherein said means for sending sends a third packet and a fourth packet with the
9 same QOS, wherein said third packet and said fourth packet contain data received in
10 datagrams on said second point-to-point session.

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1 Claim 44 (New): The first network device of claim 17, wherein said memory
2 indicates that different QOS are to be provided to different datagrams received on a first
3 point-to-point session and that different QOS are not to be provided to different datagrams
4 received on a second point-to-point session,

5 wherein said marker determines that different QOS are to be provided to a first
6 datagram and a second datagram received on said first point-to-point session,

7 wherein said marker determines that the same QOS is to be provided to a third
8 datagram and a fourth datagram received on said second point-to-point session,

9 wherein the QOS provided to packets transporting data related to said first datagram
10 is not identical to packets transporting data related to said second datagram,

11 and wherein the QOS provided to packets transporting data related to said third
12 datagram is identical to packets transporting data related to said fourth datagram.

1 Claim 45 (New): The computer readable medium of claim 24, wherein said
2 indicating indicates that different QOS are to be provided to different datagrams received
3 on a first point-to-point session and that different QOS are not to be provided to different
4 datagrams received on a second point-to-point session,

5 wherein said first network device sends a first packet and a second packet with
6 different QOS, wherein said first packet and said second packet contain data received on
7 said first point-to-point session,

8 wherein said first network device sends a third packet and a fourth packet with the
9 same QOS, wherein said third packet and said fourth packet contain data received on said
10 second point-to-point session.

1 46 (New): The communication network of claim 33, whereinsaidindicateindicates
2 that different QOS are to be provided to different datagrams received on a first point-to-
3 point session and that different QOS are not to be provided to different datagrams received
4 on a second point-to-point session,

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5 wherein said first network device sends a first packet and a second packet with
6 different QOS, wherein said first packet and said second packet contain data received on
7 said first point-to-point session,

8 wherein said first network device sends a third packet and a fourth packet with the
9 same QOS, wherein said third packet and said fourth packet contain data received on said
10 second point-to-point session.